



Monitoring of NMR porosity changes in the full-size core salvage through the drying process

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Currently the principle of nuclear magnetic resonance (NMR) is one of the most popular technologies in the field of borehole geophysics and core analysis. Results of NMR studies allow to calculate the values of the porosity and permeability of sedimentary rocks with sufficient reliability.

All standard tools for the study of core salvage on the basis of NMR have significant limitations: there is considered only long relaxation times corresponding to the mobile formation fluid. Current trends in energy obligate to move away from conventional oil to various alternative sources of energy. One of these sources are deposits of bitumen and high-viscosity oil.

In Kazan (Volga Region) Federal University (Russia) there was developed a mobile unit for the study of the full-length core salvage by the NMR method ("NMR-Core") together with specialists of "TNG-Group" (a company providing maintenance services to oil companies). This unit is designed for the study of core material directly on the well, after removing it from the core receiver. The maximum diameter of the core sample may be up to 116 mm, its length (or length of the set of samples) may be up to 1000 mm. Positional precision of the core sample relative to the measurement system is 1 mm, and the spatial resolution along the axis of the core is 10 mm. Acquisition time of the 1 m core salvage varies depending on the mode of research and is at least 20 minutes. Furthermore, there is implemented a special investigation mode of the core samples with super small relaxation times (for example, heavy oil) is in the tool.

The aim of this work is tracking of the NMR porosity changes in the full-size core salvage in time. There was used a water-saturated core salvage from the shallow educational well as a sample. The diameter of the studied core samples is 93 mm. There was selected several sections length of 1m from the 200-meter coring interval. The studied core samples are being measured several times. The time interval between the measurements is from 1 hour to 48 hours. Making the measurements it possible to draw conclusions about that the processes of NMR porosity changes in time as a result of evaporation of the part of fluid from the surface layer of the core salvage and suggest a core analysis technique directly on the well.

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